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(54) Title: METHOD AND APPARATUS FOR TIME-SHIFTING VIDEO AND TEXT IN A TEXT-ENHANCED TELEVISION PROGRAM

(57) Abstract

A television system allows a viewer of a text-enhanced television program to pause the program at a particular frame, browse the enhancements at his or her leisure, and then resume viewing the program from that frame, without losing continuity of the video and enhancement portions of the program or program content. This is accomplished by time-shifting the television program for later playback.

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METHOD AND APPARATUS FOR TIME-SHIFTING VIDEO AND TEXT IN A
TEXT-ENHANCED TELEVISION PROGRAM

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of provisional patent application serial no. 60/044,161, filed April 21, 1997, and provisional patent application serial no. 60/052,248, filed July 11, 1997, the disclosures of which are hereby fully incorporated by reference.

BACKGROUND

The present invention is a system wherein television program-related information (PRI) is embedded in the vertical blanking interval (VBI) of a television signal for display on a viewer's television screen at the same time as the television program. The PRI is typically contained in an Internet site, the addresses for which are embedded in the television signal. The Internet site addresses may also be transmitted synchronously with, but separate from the video portion, e.g., via an interface device such as a telephone or cable modem. Typically such an "enhanced" television program consists of a display with the video portion of the program in a picture-in-picture (PIP) window and the PRI in the remaining portion of the display area of the television screen.

This PRI may be any textual or graphic information associated with the current television program. The PRI may consist of a textual display of a World Wide Web (WWW) or other Internet site address to which the viewer can choose to link to through a connection with an Internet Service Provider. Alternatively, the PRI may be contained in one or more Web pages, the addresses of which are inserted into the vertical blanking interval (VBI) and are automatically retrieved by the user's terminal and displayed on the display screen. Some examples of PRI are cast members' biographies, trivia about the show, information relating to the particular episode or scene, and closeups of information that cannot be readily seen or is hidden in the video portion of the program. Some of the PRI may be time dependent on the program. For example, the PRI may change to correspond to a particular scene or frame of

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the television program.

5 With so much information on the screen, some of which may be changing at a fairly rapid pace, it is desirable to provide the viewer the option of pausing a particular frame of a text-enhanced program display and then resume viewing the program without losing continuity of the video and PRI portions of the program or program content.

10 According to one embodiment of the invention, a television system is provided which allows a viewer of a PRI-enhanced television program to pause the program at a particular frame, examine the PRI at his or her leisure, perhaps browse through other, linked Web pages, and then resume viewing the program from that frame, without losing continuity of
15 the video and PRI portions of the program or program content.

SUMMARY

20 According to one embodiment of the invention, an apparatus for time-shifting video and program related information (PRI) in an enhanced television program is provided which includes a display screen, a tuner for receiving a television signal with embedded data representative of an address for an Internet site including PRI, means for extracting the
25 embedded data from the television signal, a memory for storing the embedded data, input means for inputting viewer commands, a time-shifting apparatus capable of simultaneously storing the television signal as it is received and outputting the stored television signal for display, means for communicating with an Internet service provider to retrieve information
30 from the Internet site including the PRI, and a microcontroller. The microcontroller is configured to retrieve the Internet site address from memory and retrieve the PRI from the Internet site in response to a first viewer command, generate a composite display including a television program contained in the television signal in a first portion of the display and the
35 PRI in a second portion of the display in response to the first viewer command. control the time-shifting apparatus to store the television signal as it is received and display a still frame from the stored television signal in a first portion of the display screen in response to a

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second viewer command, and control the time-shifting apparatus to output the portion of the
5 stored television signal subsequent to the still frame for display in the first portion of the
display in response to a third viewer command.

According to another embodiment, a method for time-shifting video and program
related information (PRI) in an enhanced television program is provided which includes the
10 steps of receiving a television signal with embedded data representative of an address for an
Internet site including PRI, extracting the embedded data from the television signal, storing
the embedded data in a memory, selecting an Internet mode in response to a first viewer
command, communicating with an Internet service provider to retrieve information from the
15 Internet site including the PRI, displaying a television program contained in the television
signal in a first portion of a display screen and the PRI in a second portion of the display
screen, storing the television signal in a time-shifting apparatus and continuously displaying a
still frame from the stored television signal in response to a second viewer command, and
20 simultaneously displaying the television program subsequent to the still frame from the
stored television signal and continuing to store the television signal as it is received in
response to a third viewer command.

25 According to an alternate embodiment, one or more suspend flags are embedded in the
television signal, and the "pause" operation wherein the television signal is stored in the time-
shifting apparatus and the still frame displayed in response to detection of such a suspend
flag. This feature may be deactivated such that the "pause" operation is only performed in
30 response to a viewer command.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing features and advantages of the invention will be better understood by
35 referring to the following drawings:

FIG. 1 is a schematic block diagram of a time-shifting apparatus according to one
embodiment of the invention;

FIG. 2 is a display screen in an Internet mode of the time-shifting apparatus;

FIG. 3 is a display screen accessed by the viewer from the display screen of FIG. 2;

and

FIG. 4 is an alternate layout of the display screens of FIGS. 2 and 3.

DETAILED DESCRIPTION

In FIG. 1, the reference numerals refer to the same elements described in application Serial No. 08/475,395 filed on June 6, 1995, the disclosure of which is incorporated fully herein by reference. In addition, the system includes 1) an Internet service provider 33 connected to microprocessor 24 by a transmission link 34 such as a telephone network or a television cable, 2) a VBI decoder 35, 3) a website data memory 36 (memory 36 could be part of the RAM of microprocessor 24 or in terms of the disclosure of the '395 application, memory 22), and 4) a digital Storage Device 52 with associated analog-to-digital and digital-to-analog converters 50, 54. An interface device such as a telephone or cable modem (not shown) couples transmission link 34 to microprocessor 24, if necessary. Internet service provider 33 is connected to an Internet backbone in well known fashion to access data at any site on the WWW.

Storage device 52 is a television signal time-shifting apparatus. One such time-shifting apparatus is disclosed in U.S. patent application Serial No. 08/388,345 to Russo, et al. filed February 14, 1995, which is fully incorporated herein. Such a time-shifting apparatus includes an optical disc for storage of video programs and separate READ and WRITE heads which operate simultaneously such that real time program information can be stored on the disc while previously stored information on the disc can be read and output to the television signal for display. Other storage media which are capable of rapidly storing extremely large amounts of information may also be used, including magnetic tape, optical disk, magneto-optical disk, or solid state memory (i.e., a high capacity charge coupled device), video RAM, etc.

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The Storage Device 52 holds a large video data buffer (not shown) for storing the
television program in digital form. Preferably, the Storage Device is a random access storage
5 medium allowing concurrent reading and writing operations, so that the incoming television
signal data may be written to the Storage Device while earlier stored television signal data is
being read out for display on TV 20 (that is, time-shifting of the television signal data is
performed). The Storage Device 52 has two heads that are separately positionable. When
10 display of the television program is to be suspended, the read head is kept in the same
position until a resume command is received. The write head, however, keeps moving to
record the incoming television signal data.

15 To enable a television viewer to access information about a television program that the
viewer is watching, PRI is embedded in the VBI of the television signal carrying the
television program. For example, the PRI may be textual information regarding actors and
actresses in the show, advertisements of program-related merchandise, brief descriptions of
20 the plot of future episodes of the television program, or any other text regarding the television
program, or the PRI may be text representing web pages containing such information.

According to a preferred embodiment, the PRI is contained on a web page, the address
for which is embedded in the VBI of the television signal. When the television signal
25 carrying the program being watched is captured by tuner 11, the website data embedded in its
VBI is stripped out by VBI decoder 35 and sent to microprocessor 24 for storage in website
data memory 36. The memory addresses of the website names are linked to the website
30 addresses in memory 36. An icon appears on the screen of television 20 when the television
program is displayed full screen, i.e., in the TV mode, to inform the viewer that website data
accompanies the television signal and is stored in memory 22. If the viewer wishes to access
a website in connection with the television program, the viewer presses a button on a viewer
35 input device 28 such as a remote controller, which introduces the Internet mode of operation
shown in FIG. 2 and described below. Microprocessor 24 is programmed to carry out this
operation. By repeatedly pressing a button on the viewer input device, the viewer can toggle

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back and forth between the TV mode and the Internet mode. Although viewer inputs are
discussed herein as initiated by buttons on a remote controller, other input devices can also be
5 used. For example, a cursor could be displayed on the television screen which is movable
around the screen and a selection can be made (i.e., "clicked") when the cursor is in a desired
location of the screen.

10 In the Internet mode, the video portion of the television program last viewed in the TV
mode is displayed in area 42. As an option, a textual description of the program is displayed
in an area 44 and information about the television program, i.e., program title, station name,
and channel number are displayed in a banner 49 underneath areas 42 and 44. A message is
15 displayed at the top of an area 46 to prompt the viewer to select from a number of website
names displayed in area 46 by moving a cursor 48 with arrow keys on the viewer input
device. For example, if the television program is a serial television show, for example,
"Married With Children," the website names could be information related to the show. After
20 a website name is selected, the viewer presses a button on the viewer input device. As a
result, the website address to which the selected website name is linked is retrieved from
memory 36 by microprocessor 24 and sent through the telephone or cable interface to
Internet service provider 33. (If desired, this function of microprocessor 24 could be carried
25 out by commercial equipment sold under the trademark WEB TV.) The information at the
addressed website is downloaded from Internet service provider 33 over link 34 to
microprocessor 24 and then displayed on the screen simultaneously with the television
30 program to which the information relates, as illustrated in FIG. 3, after being composed by
video processor 30. As illustrated in FIG. 3, the name of the website can be displayed above
the text of the information from the website. If the television program is a serial television
show, as previously stated, the displayed information could include information about the
35 episode, cast biographies, and trivia related to the show. The viewer then navigates about the
website in the manner dictated by the viewer's software to find the desired information.

An alternative layout of the television screen for the present invention is shown in

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FIG. 4. In this layout, the television program is displayed in a majority portion 60 of the screen while the PRI is displayed along two border regions 62. The Web page including the PRI can be specifically configured to display the PRI in the border regions and an area designated for the real time image in the PIP. The PIP circuitry 19 is specially configured to a smaller reduction ratio, for example 1.5:1 rather than 3:1 for a standard PIP, in order to produce the larger PIP display.

The screen portion 60 displays a television program consisting of moving images.

Referring back to FIG. 1, when the viewer interacts with the website data or other PRI displayed on the television screen, the viewer's attention is diverted from the television program being shown to the website data. The viewer is then missing what is happening in the television program until the viewer's interaction with the PRI is concluded. To overcome this situation, an additional component, Storage Device 52, described above, is added to the system to "time-shift" the display of the television program. As the television signal is being received by Tuner 11, the signal is forwarded through IF Amp 12 and Picture DET 13 to VCR 17. The VCR sends the signal through an analog to digital converter (A/D) 50 to Storage Device 52. The Storage Device is under the control of the Microprocessor 24 and is capable of storing the incoming television signal in real-time as digital information for future use.

As the television signal is being stored, if a viewer wants to interact with the PRI such as website data or other textual information being displayed on the television screen, the viewer sends a command to the microprocessor 24 via the viewer input device 28. The viewer action to send the command could, for example, consist of pushing a button on the viewer input device. In response, the microprocessor 24 controls VCR 17 to output the television signal to the Storage Device 52 which begins storing the television signal, including the PRI information embedded in the VBI. The Storage Device 52 simultaneously outputs the first stored frame of the video signal to the signal processing unit for extended display on television 32. The television 32 continues to display this frame until controlled by

1 the viewer to continue without effect on any viewer activity with the PRI shown in the
remainder of the display screen. The viewer then interacts with the PRI as described above.

5 When the viewer is done interacting with the PRI, the viewer sends a command to the
microprocessor 24 to resume display of the television program. However, instead of
displaying the incoming television signal from Tuner 11, the VCR directs the delivery of the
10 stored television signal data output from the READ head of Storage Device 52 through
Digital-to-Analog Converter (D/A) 54 and SW 18 to PIP 19 for display on TV 20. The data
displayed is that part of the television program immediately subsequent to the point of
suspension. That is, it has been time-shifted. The incoming television signal data continues
15 to be stored by the WRITE head of the Storage Device 52 in a time-ordered manner
regardless of the functioning of the READ head. In other words, when display of the
television program is to be suspended, the READ head is kept in the same position until a
resume command is received. The WRITE head, however, keeps moving to record the
20 incoming television signal data. Hence, at this time the data being stored is not the same data
that is being displayed; there is a time lag between the two sets of data. In this manner, the
viewer may continue watching the program without losing continuity of the program or PRI
content. The viewer can position a cursor and enter input to freeze the display of the
25 television program image on command.

In another embodiment, the PRI is contained on several web pages, each
corresponding to a particular portion of the program and transmitted chronologically
30 throughout the duration of the program. The television signal including the embedded
website addresses is stored on the Storage Device 52 and hence the corresponding Web pages
remain linked to the appropriate portion of the television program as the signal is read out
from the Storage Device 52 after a "pause" operation. In this manner, the viewer may
35 continue watching the program without losing continuity of the program or PRI content.

The audio portion of the television signal is also stored in the Storage Device along
with the video portion. When the live television program is put into a "freeze" frame state.

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the audio portion of the television program is also suspended and not transmitted to the
viewer. Instead, the audio portion is stored. When display of the suspended television
5 program is resumed, the audio data is obtained from the Storage Device along with the video
portion and forwarded by VCR 17 through Sound Amp 15 and loudspeaker 16 to the viewer.

In another embodiment, the television signal is already in digital form, such as for
10 high-definition digital television (HDTV). Therefore, an analog to digital conversion is
unnecessary. The Storage Device continuously stores the television signal in a wraparound
fashion whenever the system is operational, overwriting the oldest previously stored
television signal data when the Storage Device becomes full. The Storage Device should be
15 large enough to hold two to three hours of television programming before overwriting earlier
broadcast television signal data.

The present invention allows a viewer to interrupt his or her viewing of a television
program to interact with PRI carried in the VBI of the television signal and displayed on the
20 television screen, and yet rejoin the television program at a later point in time without
missing any of the program.

In another embodiment, the display of the incoming television signal may be
25 suspended automatically by inserting a suspend flag into the VBI, rather than by an explicit
action by the viewer. When the suspend flag is detected by the microprocessor 24 after
decoding by VBI decoder 35, the microprocessor instructs the VCR via a control link (not
shown) to suspend the current display of the television signal. Resumption of display of the
30 television program is commenced by viewer input. The viewer could also override the
automatic suspension feature provided by the suspend flag by setting a predetermined control
value to override all automatic suspend flags, or by entering viewer input when the
suspension activity occurs in order to rapidly rejoin the television program in progress.
35 Alternatively, a resume flag is inserted into the VBI at a predetermined time after the suspend
flag. When the resume flag is received, the microprocessor automatically controls the VCR
to resume display of the television program.

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According to yet another embodiment, the viewer may access the information as any
other storage media, such as a video tape, and pause, rewind, or fast forward to different
5 portions of the program stored on the disc after the initially "pause" command. It may be
desirable to continuously record the program on the time-shifting apparatus 46 regardless of a
viewer "pause" command to allow for these functions over a period of time, limited only by
10 the storage capacity of the time-shifting device.

Although the present invention has been described with respect to particular
embodiments, those skilled in the art will appreciate that the present invention may be
modified without departing from the scope of the invention. Accordingly, all such
15 modifications are intended to be included within the scope of the invention as defined by the
following claims.

CLAIMS:

1. Apparatus for time-shifting video and program related information (PRI) in an enhanced television program comprising:

- a display screen;
- a tuner for receiving a television signal with embedded data representative of an address for an Internet site including PRI;
- means for extracting the embedded data from the television signal;
- a memory for storing the embedded data;
- input means for inputting viewer commands;
- a time-shifting apparatus capable of simultaneously storing the television signal as it is received and outputting the stored television signal for display;
- means for communicating with an internet service provider to retrieve information from the internet site including the PRI; and
- a microcontroller comprising
 - means for retrieving the internet site address from memory and retrieving the PRI from the internet site in response to a first viewer command;
 - means for generating a composite display including a television program contained in the television signal in a first portion of the display and the PRI in a second portion of the display in response to the first viewer command,
 - means for controlling the time-shifting apparatus to store the television signal as it is received and display a still frame from the stored television signal in a first portion of the display screen in response to a second viewer command, and
 - means for controlling the time-shifting apparatus to output the portion of the stored television signal subsequent to the still frame for display in the first portion of the display in response to a third viewer command.

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2. The apparatus of claim 1 wherein the time-shifting apparatus is an optical disc.
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3. The apparatus of claim 1 wherein the time-shifting apparatus is a solid state memory.
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4. The apparatus of claim 1 wherein the PRI comprises text and graphics related to the television program.
- 15
5. The apparatus of claim 4 wherein the PRI comprises a plurality of website addresses.
- 20
6. The apparatus of claim 5 wherein the microcontroller comprises means for retrieving information from one of said plurality of website addresses in response to a fourth viewer command.
- 25
7. The apparatus of claim 1 wherein the first portion of the display covers a minor portion of the display screen and the second portion of the display covers a major portion of the display screen.
- 30
8. The apparatus of claim 1 wherein the first portion of the display covers a major portion of the display screen and the second portion of the display covers a minor portion of the display screen.
- 35
9. The apparatus of claim 1 wherein the means for communicating with the internet service provider is a modem.

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10. A method for time-shifting video and program related information (PRI) in an enhanced television program comprising the steps of:

5 receiving a television signal with embedded data representative of an address for an internet site including PRI;

extracting the embedded data from the television signal;

10 storing the embedded data in a memory;

selecting an internet mode in response to a first viewer command;

communicating with an internet service provider to retrieve information from the internet site including the PRI;

15 displaying a television program contained in the television signal in a first portion of a display screen and the PRI in a second portion of the display screen;

storing the television signal in a time-shifting apparatus and continuously displaying a still frame from the stored television signal in response to a second viewer command; and

20 simultaneously displaying the television program subsequent to the still frame from the stored television signal and continuing to store the television signal as it is received in response to a third viewer command.

25 11. The method of claim 10 wherein the PRI comprises a plurality of website addresses and further comprising the steps of:

selecting one of the plurality of website addresses in the PRI;

30 retrieving information from the selected website address; and

displaying the information from the selected website address.

12. A method for time-shifting video and program related information (PRI) in an enhanced television program comprising the steps of:

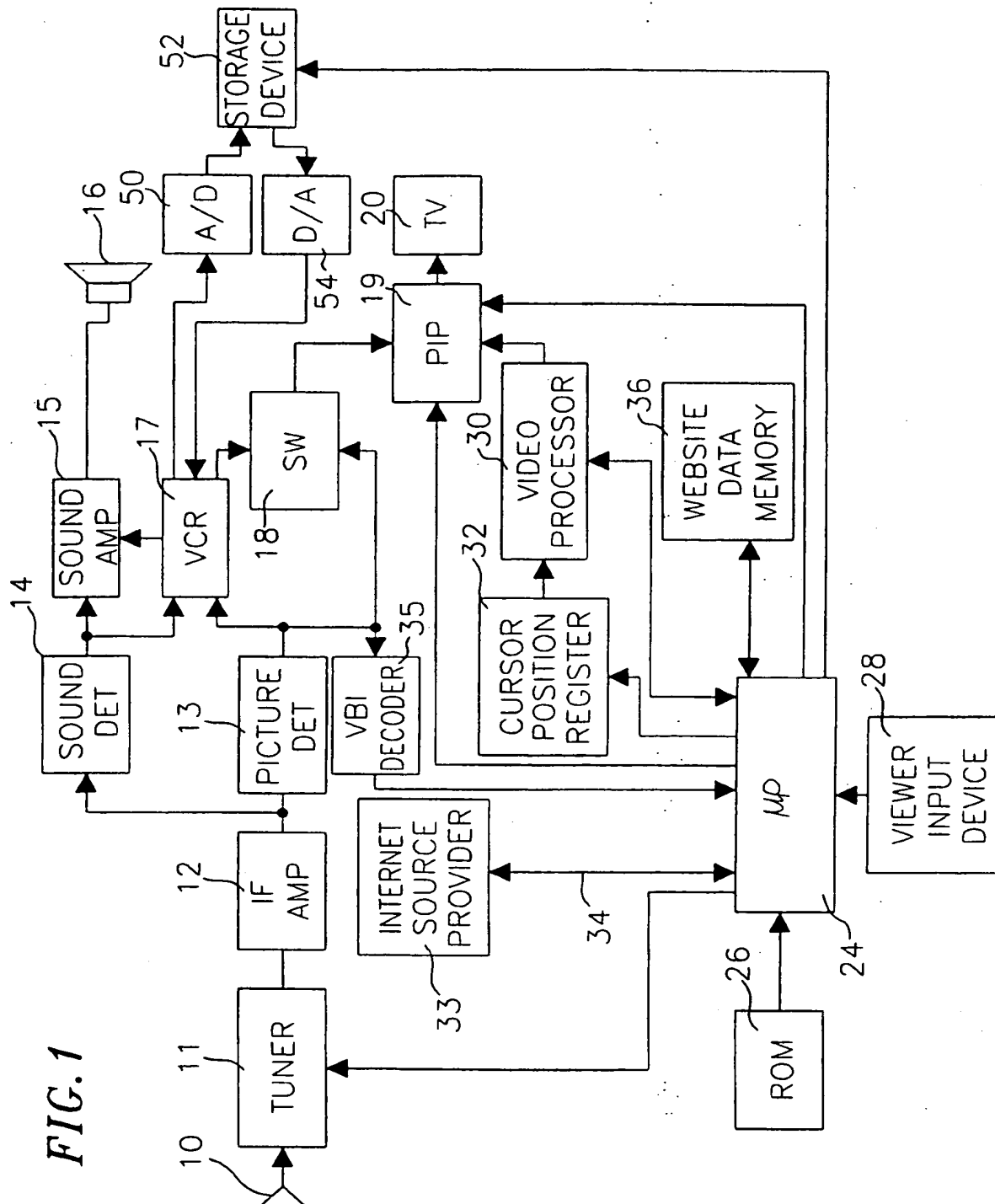
35 receiving a television signal with embedded data representative of an address for an internet site including PRI and a suspend flag;

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extracting the embedded data from the television signal;
storing the embedded data in a memory;
selecting an internet mode in response to a first viewer command;
communicating with an internet service provider to retrieve information from the
internet site including the PRI;
displaying a television program contained in the television signal in a first portion of a
display screen and the PRI in a second portion of the display screen;
detecting the suspend flag;
storing the television signal in a time-shifting apparatus and continuously displaying a
still frame from the stored television signal; and
simultaneously displaying the television program subsequent to the still frame from
the stored television signal and continuing to store the television signal as it is received in
response to a second viewer command.

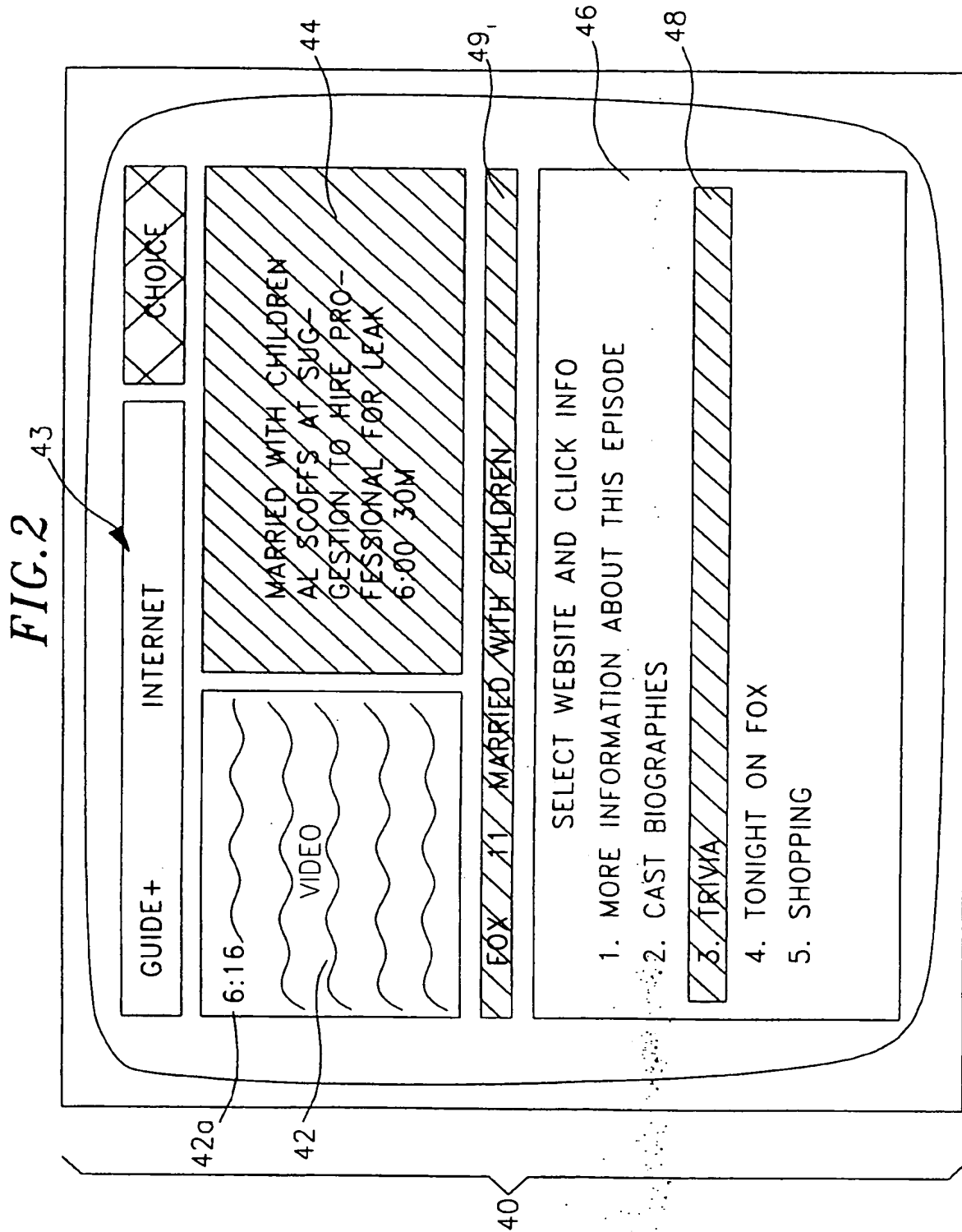
13. The method of claim 12 wherein the step of storing television signal in the
time-shifting apparatus is performed in response to detecting the suspend flag.

14. The method of claim 12 wherein the step of storing the television signal in the
time-shifting apparatus is performed in response to a third viewer command.



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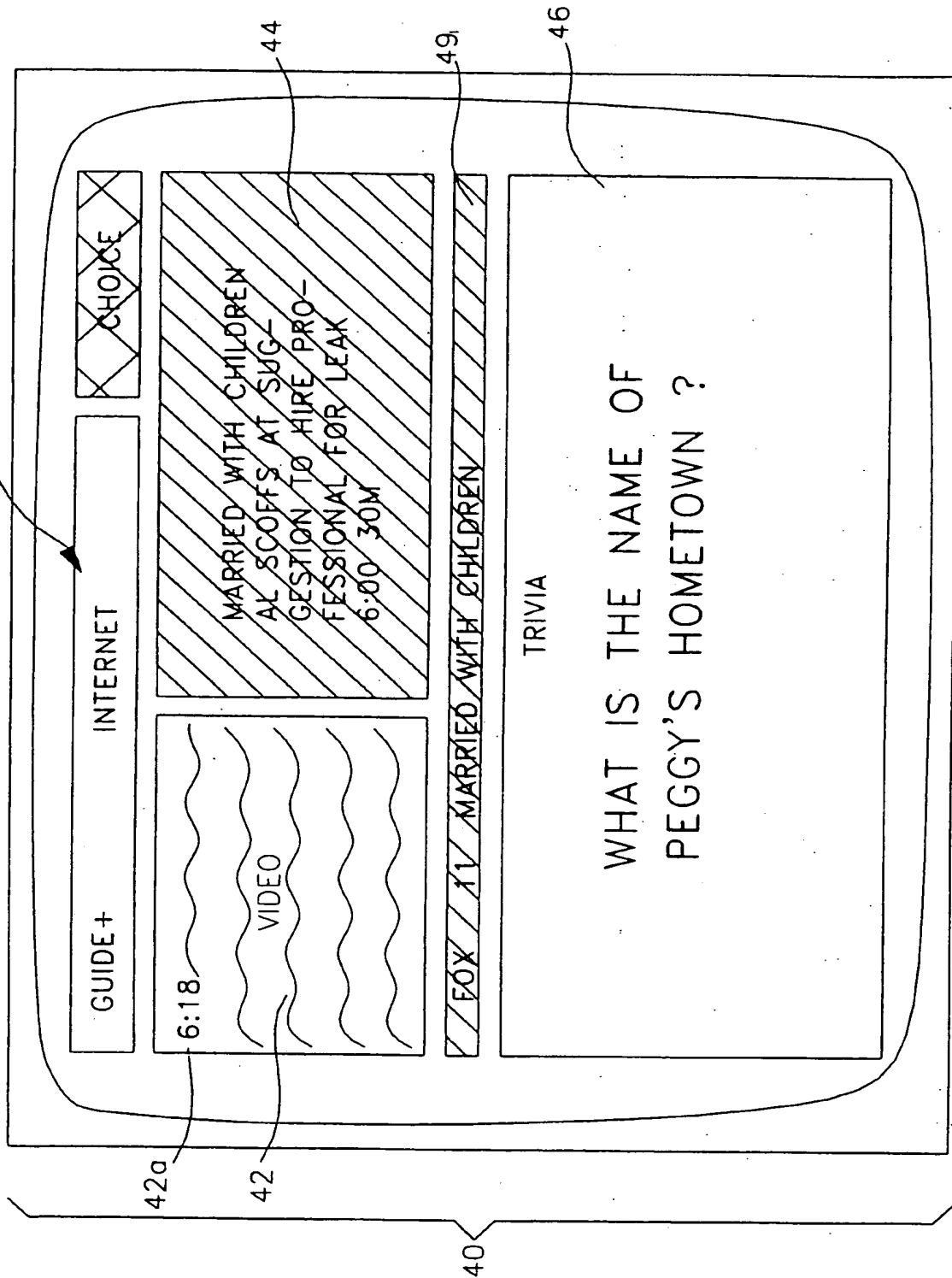
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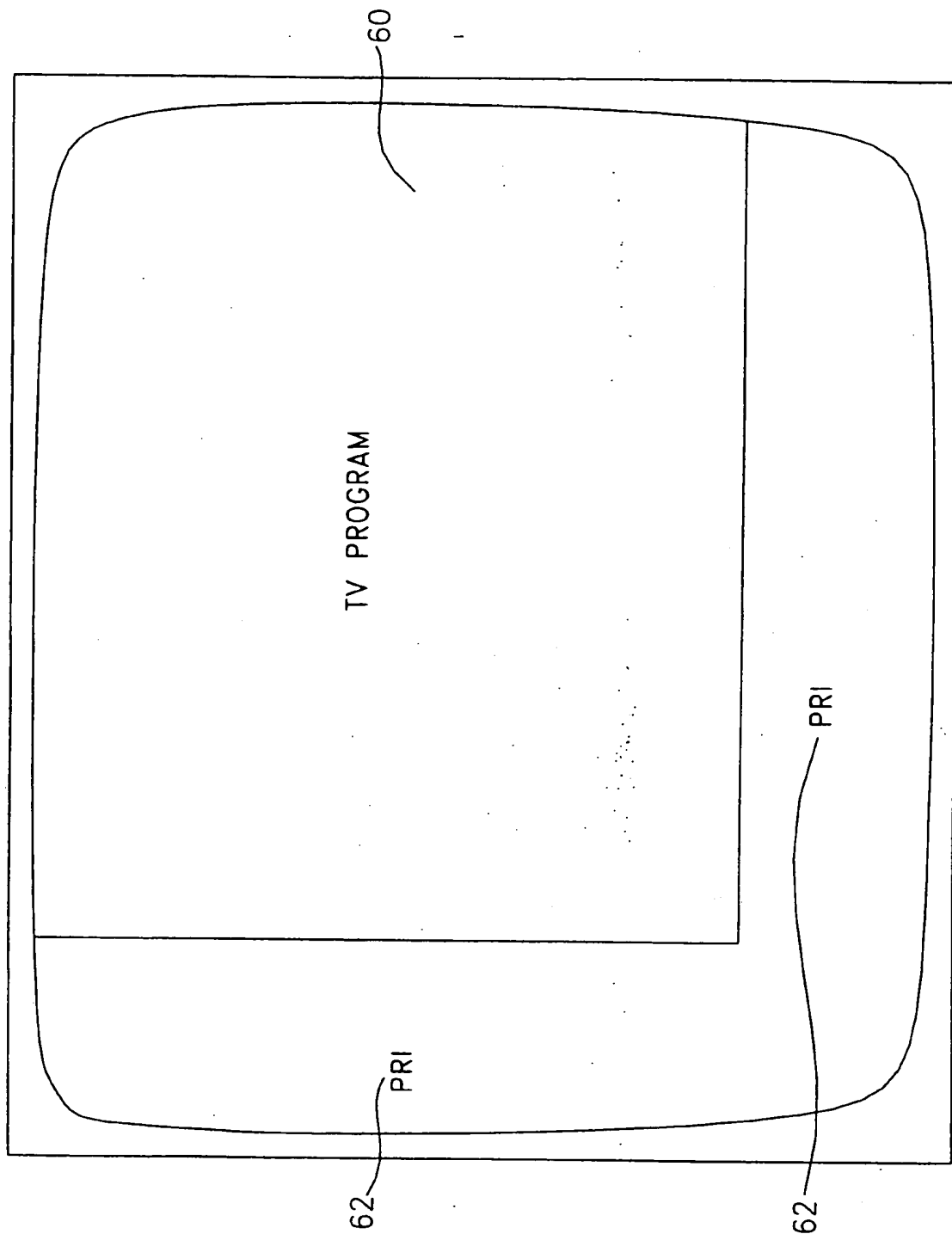
FIG. 3



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FIG. 4



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